

ALASKA FIRE SCIENCE CONSORTIUM



A JFSP Knowledge Exchange Network



WEBINAR SUMMARY

Presented Feb. 25, 2014

Recorded **video** available at:

<https://vimeo.com/87797023>

or Previous Events/Webinars at:

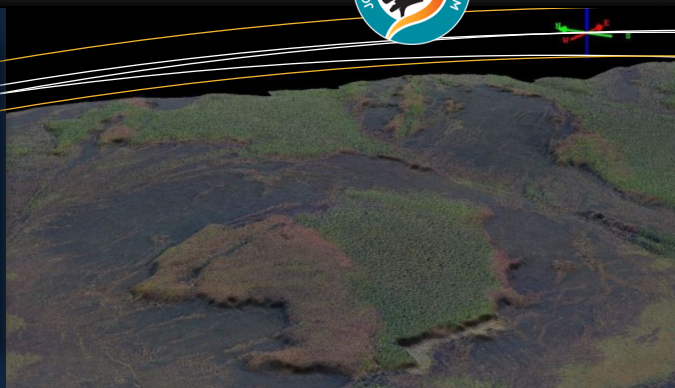
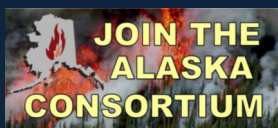
<http://akfireconsortium.uaf.edu>

Webinar Pointers:

- ♦ Technology in creating rectified aerial photos has recently advanced
- ♦ Low-cost aerial photogrammetry can be a good tool for inventory, burn assessment, monitoring, and change detection.
- ♦ Matt has developed a simple system at UAF and is looking for partners for new applications.

Matt's website:

www.drmattnolan.org



Aerial orthophoto of recent burn near Lake Minchumina. 2013, M. Nolan

Dr. Matt Nolan shared results from his recent airborne photogrammetry campaigns in Alaska, and related them to possible fire and forest management applications.

What do Forest Fires, Caribou, and Monster Truck Tires have in Common?

Matt Nolan is a Research Associate Professor at UAF's Institute of Northern Engineering with degrees in geophysics and arctic and mechanical engineering. He has been pioneering new high-tech uses of an old tool—the aerial photo. With new advances in computer processing and display technologies, airborne Digital SLR Photogrammetry is an even more powerful tool for field sciences, especially in remote areas like Alaska. Compared to LiDAR (*Light Detection and Ranging*, or aerial 3D laser scanning), the low cost of DSLR photogrammetry makes it more affordable to make time-series of high-resolution maps, opening up new possibilities for analyzing and understanding changes in the environment. Forest inventory, fire fuels assessments (like canopy height), snow depth, and post-burn vegetation recovery and monitoring are just a few examples of

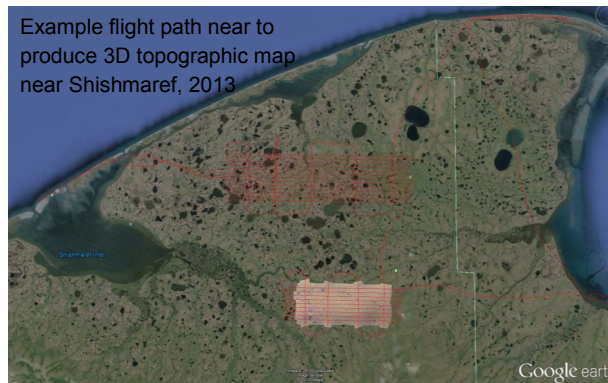


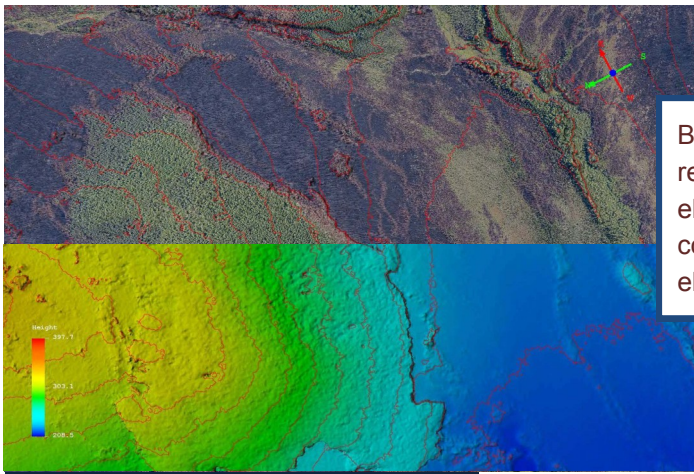
applications that could benefit from time-series of topographic measurements on an annual, monthly, or other repeating basis.

It all comes down to “FODAR”

“Fodar” is the term Matt uses to describe the art and science of **measuring distance** using digital photography. LiDAR has become increasingly popular for forest/fuels applications where landscape mapping in an accurate 3D projection is helpful, however equipment costs, operational complexity, and processing to finished product can be very expensive.

Example flight path near to produce 3D topographic map near Shishmaref, 2013





Burned area photo resolved into a digital elevation map with colors representing elevations.

Capabilities

Resolution of photos depends on the altitude flown, but typically ranges between 25 cm (at 4,000' AGL) to 6 cm (at 1,000' AGL). Photos are rectified into topography via computer processing. Matt's tests indicate a high degree of precision and repeatability of the photos and ground features as small as cracks in runway asphalt!

Snow depth is expensive to measure using typical field sampling, but repeat

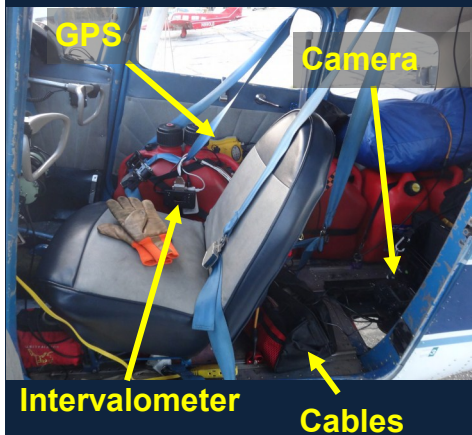
'Fodar' compared to LiDAR:

- * **Better resolution**
- * **Equal accuracy/precision**
- * **Yields co-registered orthophoto with terrain**
- * **Imagery in addition to topography**
- * **Hardware costs lower (10x to 1000x less)**

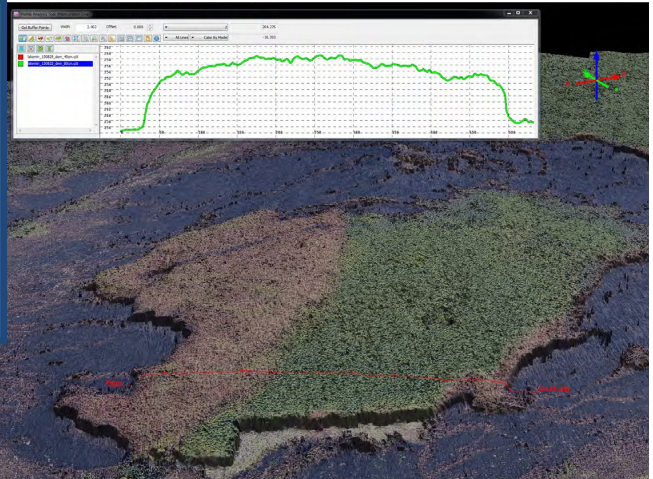
substantial CPU time—which may not be available to everyone. Other limitations to the technique include our current GPS technology—which has a “fuzz” factor of about 5-10 cm, and the requirement of paired

“Because of the lower costs (of modern photogrammetry) we now have the opportunity to study change of the earth's surface at unprecedented detail and frequency.” M. Nolan

Photogrammetry equipment :
Costs between \$5,000-\$15,000



Example of measuring canopy height across a transect (red line): the unburned island averages about 20m. An area of jack-strawed birch logs can be seen at the bottom.



photogrammetry (subtracting summer from winter images) produced results accurate to a few centimeters for an entire area of interest.

What's the Down Side?

Matt points out that although the hardware package (left) is relatively cheap, it requires some expertise to plan missions and acquire high-quality imagery. Processing photos requires

parallax images to get a 3D model, so moving targets don't work well.

Conclusions

Matt is looking for agency partners who would like to test his system on new ecological projects, and is also available for advice on setting up a “Fodar” system. Contact him at: (907)455-6288 for more info.

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